Medical oxygen: a necessity or a luxury in humanitarian settings?

Lancet Glob Health 2025
Published Online
February 17, 2025
https://doi.org/10.1016/S2214-109X(24)00509-6
See Online/The Lancet Global Health Commission
https://doi.org/10.1016/S2214-109X(24)00496-0

Although medical oxygen is a necessity and life-saving essential medicine, availability is unfortunately not guaranteed, especially in conflicts and humanitarian emergencies. When medical oxygen is available in the field, the supply is most commonly derived from oxygen concentrators. Oxygen concentrators are robust machines that extract ambient oxygen to concentrate and deliver it to the patient at a flow rate of up to 5–10 L/min. Oxygen concentrators are powered by electricity from an outlet or generator (which requires fuel) and might not provide a high enough flow or pressure to be compatible with heated and humidified high-flow nasal cannula (HFNC) oxygen or ventilators. Producing and storing oxygen as liquid or gas (ie, in cylinders) is more suitable for settings that do not have reliable electrical power; however, this process is complex and costly, posing logistical and supply chain challenges and potentially provides decreased quality of medical oxygen.

As the COVID-19 pandemic has highlighted, many patients require 15–20 L/min of oxygen—more than a standard oxygen concentrator can provide. In Yemen, at the beginning of the COVID-19 pandemic, nearly all patients required at least 30 L/min.[1] More than 250 large oxygen cylinders were needed daily. In Yemen, Haiti, and Burkina Faso, oxygen plants were constructed to meet demand. Staff were trained to troubleshoot potential emergencies related to medical oxygen production and clinical scenarios involving patients with hypoxia.

Innovative solutions involving 3D-printed connectors or repurposed adaptors have been used to connect several oxygen concentrators in series to produce increased flow rates. In Ukraine, this type of network was created with oxygen generators in a train carriage connected to an intensive care unit (ICU) carriage to deliver medical oxygen to patients who were critically ill, of whom some were mechanically ventilated.[2] This arrangement allowed patients from the conflict-affected east to be transported by the medical train to the west—a 21 h journey.

In Gaza, patients who are wounded and critically ill have nowhere to go for further treatment as medical evacuation is almost impossible. Humanitarian aid is barely arriving, with oxygen concentrators banned by the Israeli military, listing them as potentially dangerous equipment. The few functioning hospitals with pre-existing oxygen plants depend on improvised repairs while living in constant fear of breakdown and sudden loss of medical oxygen. Occasionally, convoys transport oxygen cylinders between health-care centres, but this movement is risky as they must navigate between bombardments. In Gaza, many critical medical items are in short supply. Oxygen masks, oropharyngeal airways, and endotracheal tubes, all typically single use, are reused. Consumables and accessories required to deliver medical oxygen to patients are rare and a precious commodity. In Sudan, searching for medical oxygen is critical for patients' survival, and health-care workers have lost their lives in doing so.[3,4]

HFNC has become the standard of care for many respiratory pathologies; however, HFNC is an inaccessible luxury for most humanitarian field sites. Oxygen machines are scarce, and those that are accessible usually have insufficient oxygen sources that can provide the required high flow, particularly for adults. There are few studies about HFNC in humanitarian settings because conducting research in our contexts is challenging on top of the day-to-day activities; however, advocacy for access to oxygen therapies, such as HFNC, is difficult without evidence. Therefore, in Yemen, Médecins Sans Frontières (MSF) has implemented use of HFNC in children (in whom the 10 L/min oxygen concentrators are sufficient) while integrating a research study. Additionally, as MSF applies lessons learnt from other contexts, use of HFNC has been implemented for adults by connecting oxygen concentrators in series in Kenya (predominately patients with advanced HIV), and in a Bangladeshi hospital within the Rohingya refugee camp.

There are also populations for whom oxygen therapy is nearly impossible, despite being available. Patients with Ebola virus disease are still stigmatised and rarely have access to adequate care, including basic oxygen therapy. Infection prevention control measures, fear of the disease, and logistic difficulties (ie, forgoing all medical material brought to an Ebola care zone to prevent cross contamination and poor monitoring) explain the untreated hypoxaemia.[5]

Often, field challenges include decision making for triage (ie, who should we treat?). These decisions are influenced not only by prevailing medical factors, but also by associated logistical and pragmatic factors. For example, when there is no mechanical ventilator in the ICU, then there is no choice but to extubate a postoperative patient with open abdomen. Additionally, simple therapies, such as a homemade incentive spirometer devices (eg, a glove attached to a syringe) for chest physiotherapy and awake prone positioning, are still effectively used in humanitarian settings, something almost forgotten about in high resource health-care systems. In environments where there are little to no medical supplies, even the smallest measures can make a considerable difference in preventing the recurrent loss of life due to inadequate access to medical oxygen.

Medical oxygen should not be considered a luxury, even during a humanitarian crisis. We urgently need more investment in health-care systems and research to develop sustainable and safe access to medical oxygen.

We declare no competing interests.

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